Crop Sequence Influence on Fusarium Head Blight from Wheat and Barley

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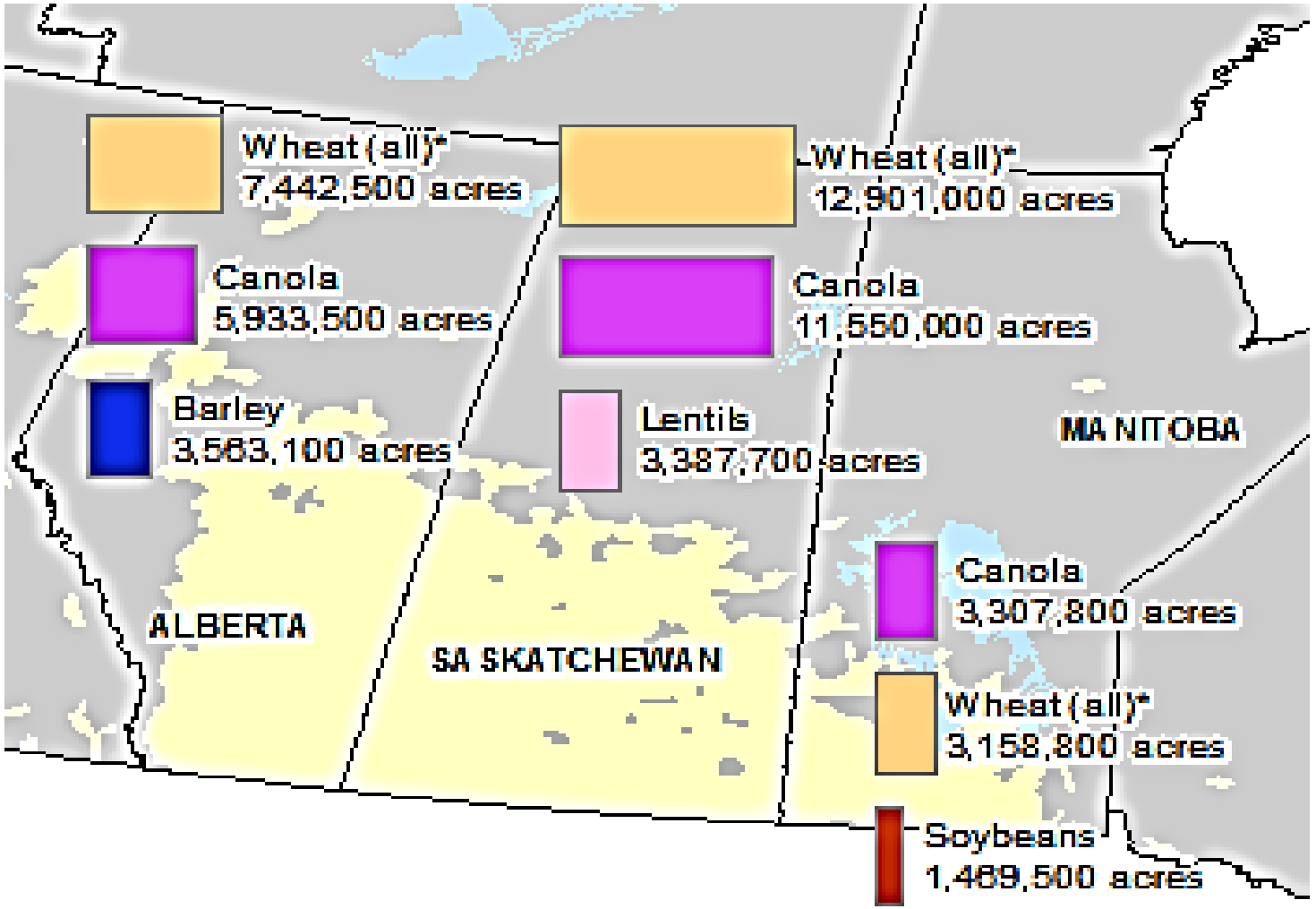
How diverse are crop rotations in western Canada?

- Main field crops in Canada: cereals and pulses

- In the prairies the crop rotation is less-diverse

wheat-canola-pea (pulses)
wheat-canola-wheat

- A less-diverse crop sequence increase cereal diseases risk



Statistic Canada, Agriculture Division, 2019

Fusarium head blight (FHB) affects cereals

- Fusarium head blight affects small-grain cereals across the prairies
- Wheat, barley, oat, canary seed
- Around 17 species from *Fusarium* spp.
- Produce mycotoxin deoxynivalenol (DON) toxic for humans and animals
- Species complex: *F. culmorum, F. poae, F. avenaceum, F. sporotrichioides*
- Principal causal agent is *F. graminearum*

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Research Hypothesis

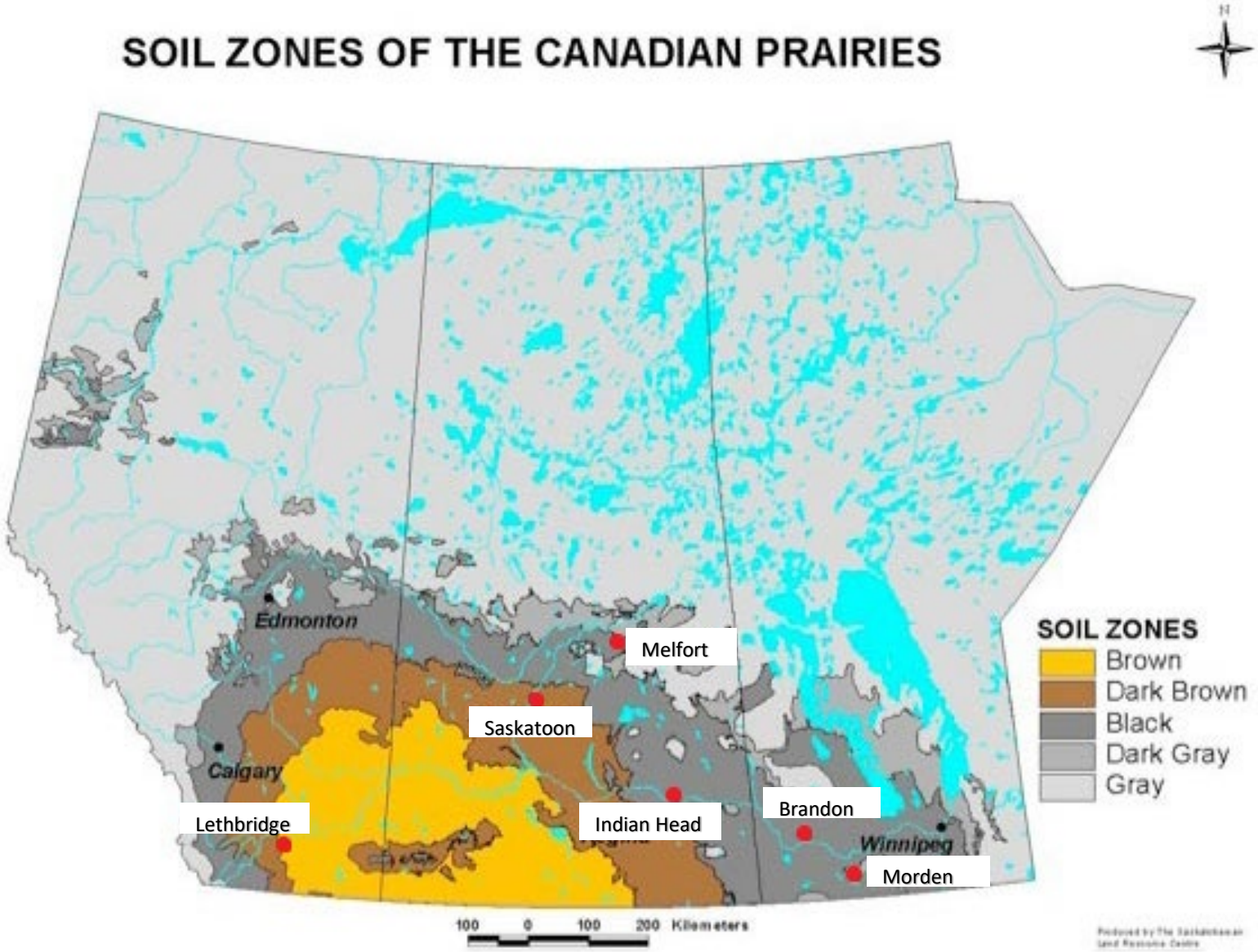
A diverse crop sequence that includes host and non-host crops can influence FHB from wheat and barley at six locations across western Canada.

Research Objectives

To **determine optimum crop sequences that minimize FHB** of wheat and barley in the Canadian prairies.

Evaluate **root rot and leaf spotting diseases** in sequences that include up to five of the most widely grown crops in western Canada.

Crop sequence study in the Prairies



Locations

- Lethbridge
- Melfort
- Saskatoon
- Indian Head
- Brandon
- Morden

Crops

- Wheat
- Barley
- Canola
- Pea
- Corn/Maize

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Les Fuller,.2010. Prairie Soils & Crops Journal, 3:37-45

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A Diverse Crop Sequence Experiment

Experiments will be conducted over three-year growing seasons in a **split-block design**

Additional crops for each location

Location	Additional crops seeded
Lethbridge	durum, dry bean
Melfort	lentil
Indian Head	durum, soybean, canary seed
Saskatoon	flax, canary seed, oat, lentil
Brandon	soybean
Morden	soybean

Plot Plan

Year 3 – 2020 All plots with Cereal: Durum/Wheat or Barley

Year 1 2018

2020
2 sites durum/1 site wheat
3 sites barley

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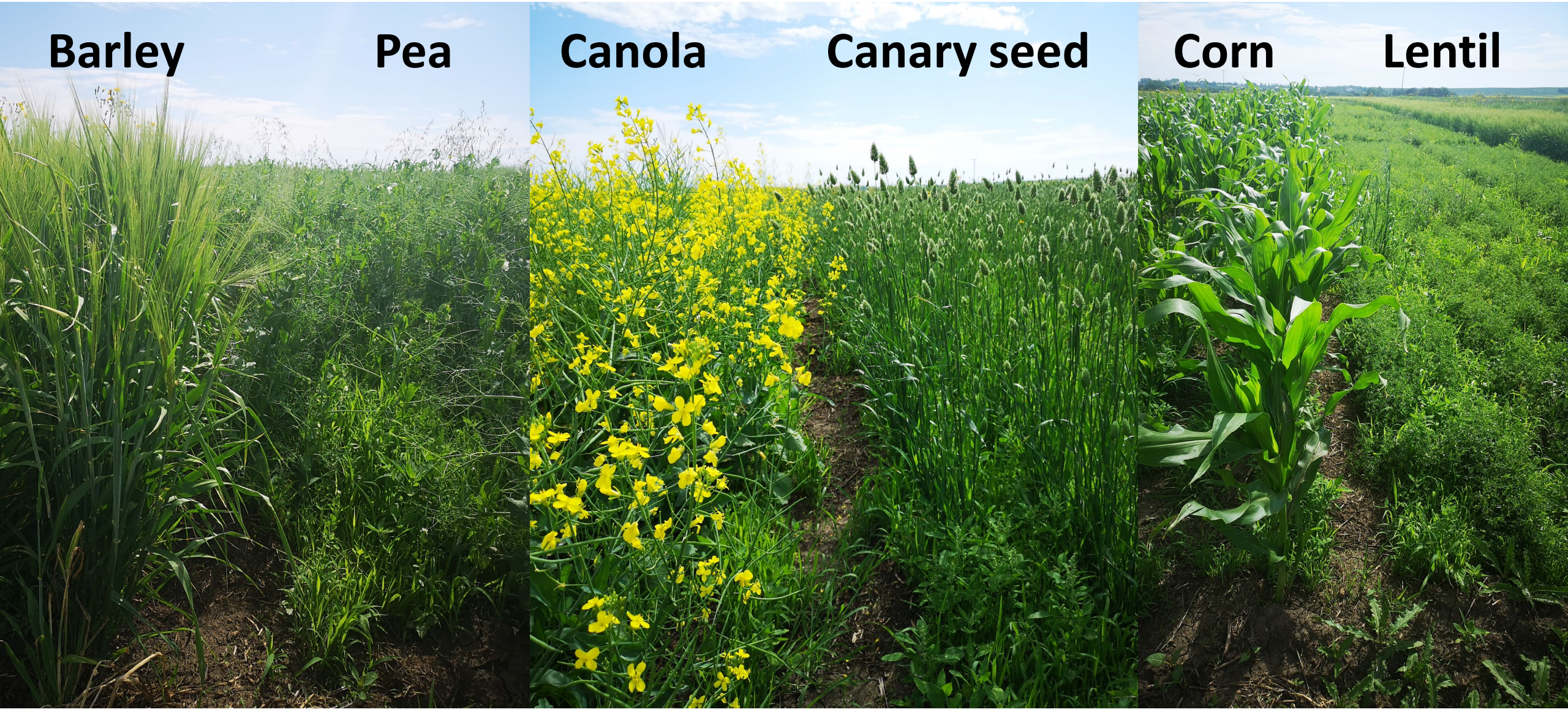

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Parameters

Yield (kg/ha) from all crops

(1) Diseases

(2) Quality parameters

FHB infected durum spikes

FHB Index

Leaf Spot Diseases

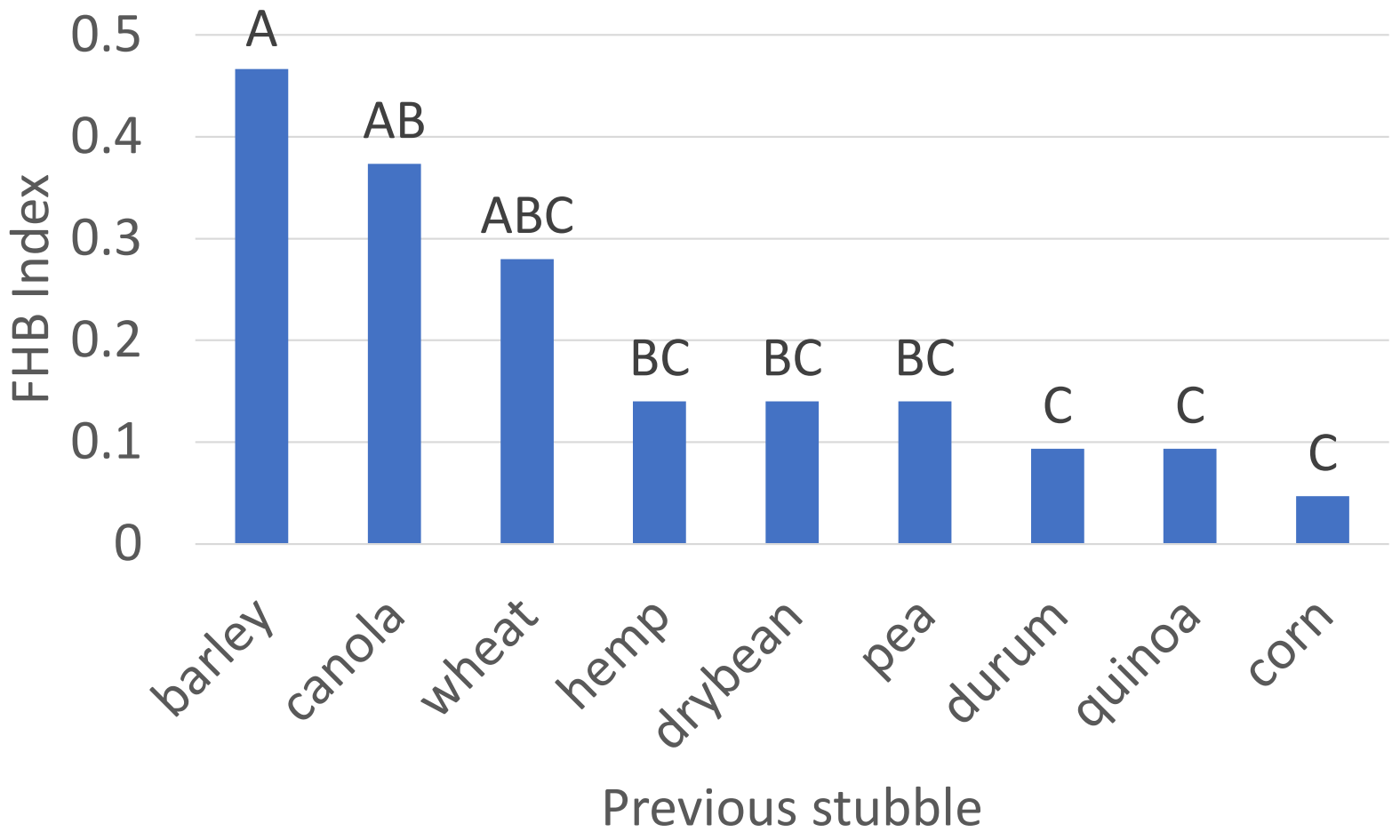
Common Root Rot

Preliminary Results

P-value for crop yields on previous stubbles

Location	Wheat	Durum	Barley	Canola	Pea	Maize
Lethbridge	0.012	0.005	0.4568	0.183	0.144	0.0463
Melfort	nd	0.11	0.03	0.035	0.211	nd
Saskatoon	nd	0.70	0.42	0.637	0.150	nd
Indian Head	0.131	0.14	0.0007	0.398	0.0006	0.0025
Brandon	0.0004		0.711	0.472	0.132	0.375

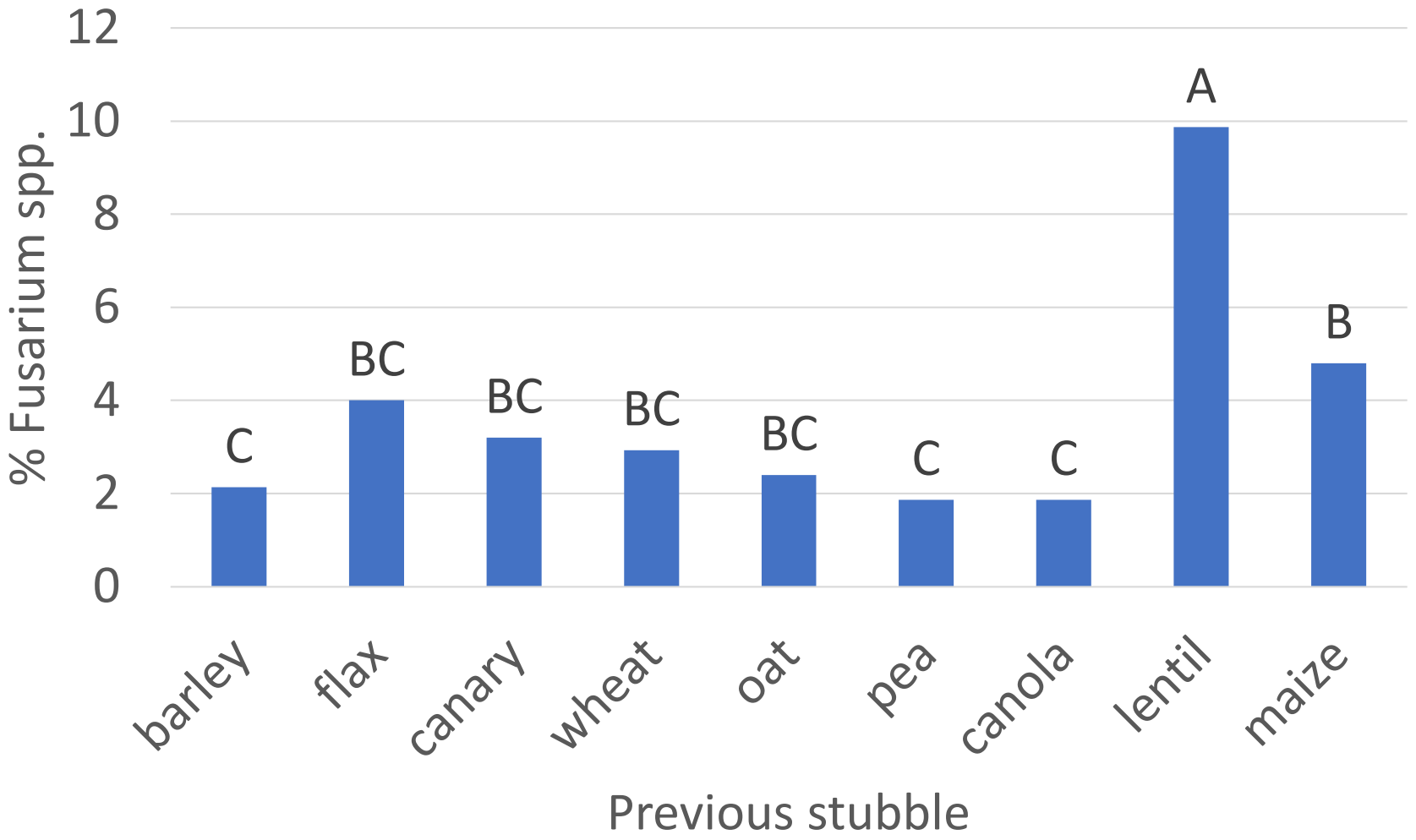
FHB index Lethbridge 2019



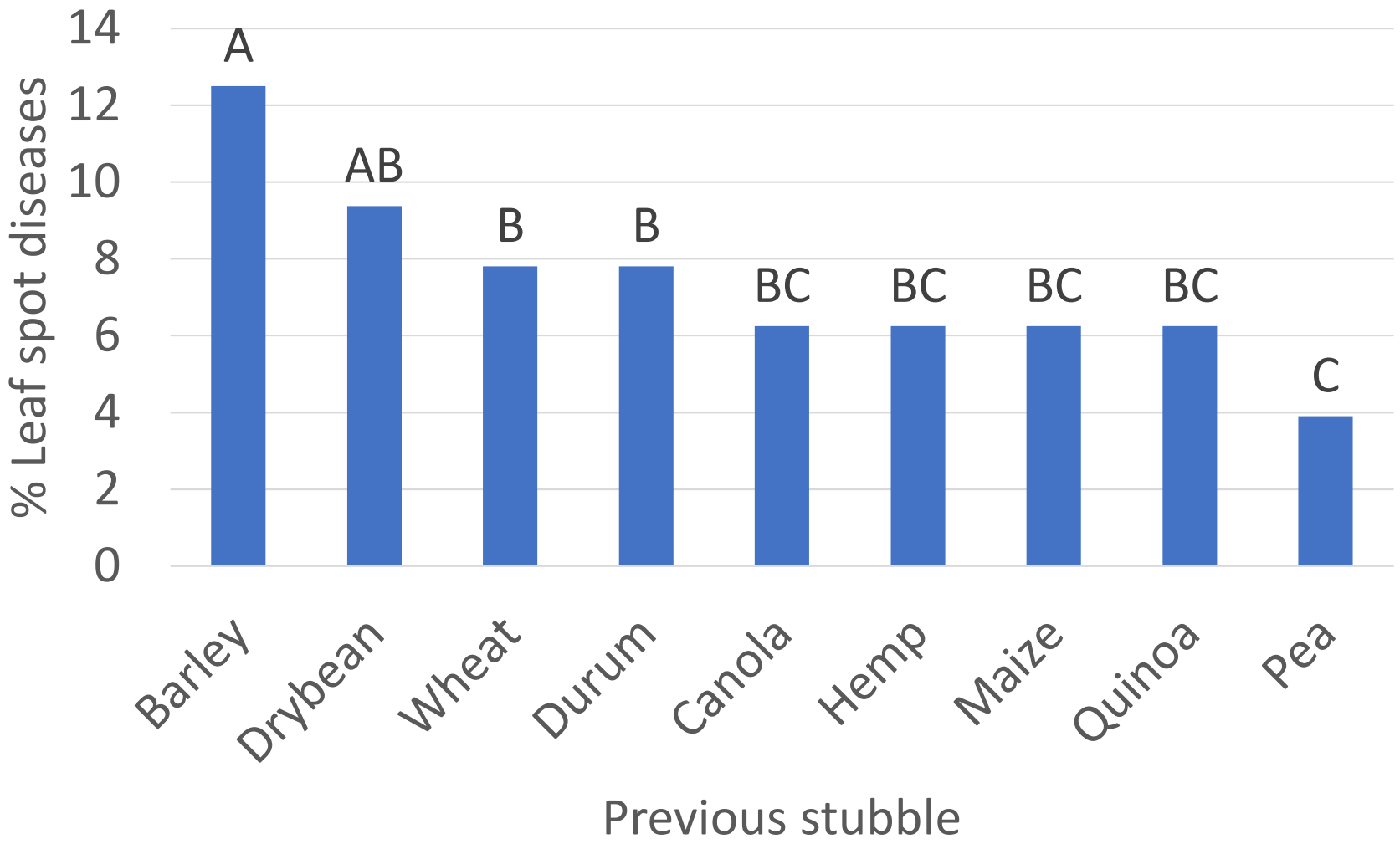
Location	Wheat	Durum	Barley
Lethbridge	0.07	0.76	0.05

Wheat kernels infection Saskatoon 2019

Stubble effect on wheat kernels	
Pathogen	**P value**
***Fusarium* spp.**	<.0001
***Alternaria* spp.**	0.049
***Epicoccum* spp.**	0.53



Barley leaf spot diseases Lethbridge 2019



Preliminary conclusions

- Growing barley on barley in a sequence have significant effects on FHB index and leaf spot diseases
- Lentil stubble have a significant effect on *Fusarium* spp. presence on wheat kernels from Saskatoon
- Improve recommendations for cereal growers in western Canada by adding a diverse crop sequence to reduce FHB in the prairies.

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